

# N-Channel Switch

## J111, J112, J113, MMBFJ111, MMBFJ112, MMBFJ113

### Features

- This Device is Designed for Low Level Analog Switching, Sample and Hold Circuits and Chopper Stabilized Amplifiers
- Sourced from Process 51
- Source & Drain are Interchangeable
- These are Pb-Free Devices

**ABSOLUTE MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)  
(Note 1, 2)

Symbol	Parameter	Value	Unit
$V_{DG}$	Drain-Source Voltage	35	V
$V_{GS}$	Gate-Source Voltage	-35	V
$I_{GF}$	Forward Gate Current	50	mA
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to 150	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. These ratings are based on a maximum junction temperature of  $150^\circ\text{C}$ .
2. These are steady-state limits. ON Semiconductor should be consulted on applications involving pulsed or low-duty-cycle operations.

**THERMAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

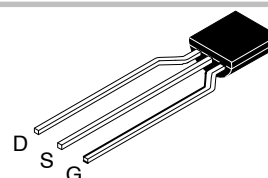
Symbol	Parameter	Max		Unit
		J111 / J112 / J113 (Note 3)	MMBFJ111 / MMBFJ112 / MMBFJ113 (Note 4)	
$P_D$	Total Device Dissipation	625	350	mW
	Derate Above $25^\circ\text{C}$	5.0	2.8	mW/ $^\circ\text{C}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	125	-	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	200	357	$^\circ\text{C}/\text{W}$

3. PCB size: FR-4, 76 mm x 114 mm x 1.57 mm (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.
4. Device mounted on FR-4 PCB 36 mm x 18 mm x 1.5 mm; mounting pad for the collector lead minimum  $6\text{ cm}^2$ .

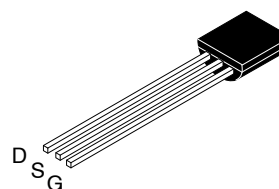


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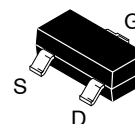
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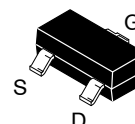
**TO-92 3 4.83x4.76 LEADFORMED  
CASE 135AR**



**TO-92 3 4.825x4.76  
CASE 135AN**

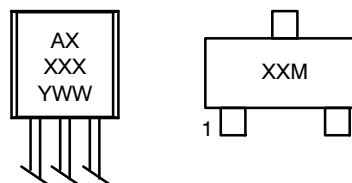


**SOT-23 (TO-236)  
CASE 318-08**



**SOT-23  
CASE 318BM**

### MARKING DIAGRAMS



XXXX, XX = Specific Device Code  
A = Assembly Plant Code  
Y = Year  
WW = Work Week  
M = Date Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

# J111, J112, J113, MMBFJ111, MMBFJ112, MMBFJ113

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Max	Unit
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### OFF CHARACTERISTICS

$V_{(BR)GSS}$	Gate-Source Breakdown Voltage	$I_G = -1.0 \mu\text{A}, V_{DS} = 0$	-35	-	V	
$I_{GSS}$	Gate Reverse Current	$V_{GS} = -15 \text{ V}, V_{DS} = 0$	-	-1.0	nA	
$V_{GS(off)}$	Gate-Source Cut-Off Voltage	$V_{DS} = 5 \text{ V}, I_D = 1.0 \mu\text{A}$	111	-3.0	-10.0	V
			112	-1.0	-5.0	
			113	-0.5	-3.0	
$I_D(off)$	Drain Cutoff Leakage Current	$V_{DS} = 5.0 \text{ V}, V_{GS} = -10 \text{ V}$	-	1.0	nA	

### ON CHARACTERISTICS

$I_{DSS}$	Zero-Gate Voltage Drain Current (Note 5)	$V_{DS} = 15 \text{ V}, V_{GS} = 0$	111	20	-	mA
			112	5.0	-	
			113	2.0	-	
$r_{DS(on)}$	Drain-Source On Resistance	$V_{DS} \leq 0.1 \text{ V}, V_{GS} = 0$	111	-	30	$\Omega$
			112	-	50	
			113	-	100	

### SMALL SIGNAL CHARACTERISTICS

$C_{dg(on)}$ $C_{sg(on)}$	Drain-Gate & Source-Gate On Capacitance	$V_{DS} = 0, V_{GS} = 0, f = 1.0 \text{ MHz}$	-	28	pF
$C_{dg(off)}$	Drain-Gate Off Capacitance	$V_{DS} = 0, V_{GS} = -10 \text{ V}, f = 1.0 \text{ MHz}$	-	5.0	pF
$C_{sg(off)}$	Source-Gate Off Capacitance	$V_{DS} = 0, V_{GS} = -10 \text{ V}, f = 1.0 \text{ MHz}$	-	5.0	pF

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

5. Pulse test: pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

TYPICAL PERFORMANCE CHARACTERISTICS

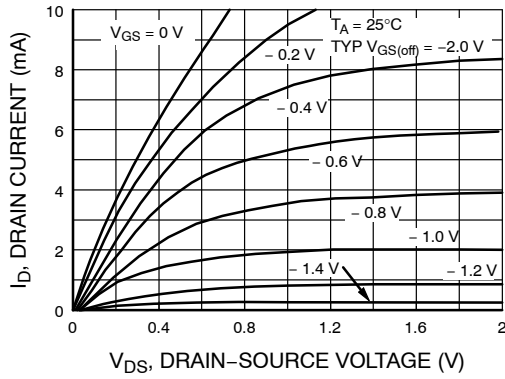


Figure 1. Common Drain-Source



Figure 2. Parameter Interactions



Figure 3. Transfer Characteristics



Figure 4. Transfer Characteristics

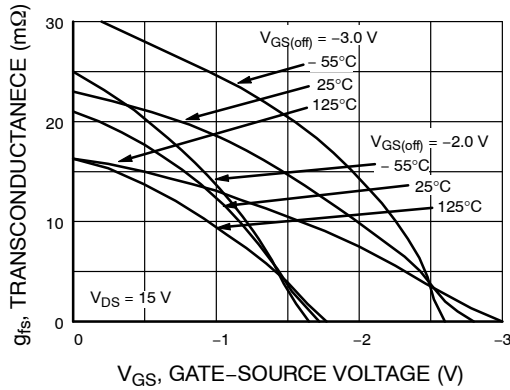


Figure 5. Transfer Characteristics



Figure 6. Transfer Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)



Figure 7. On Resistance vs. Drain Current

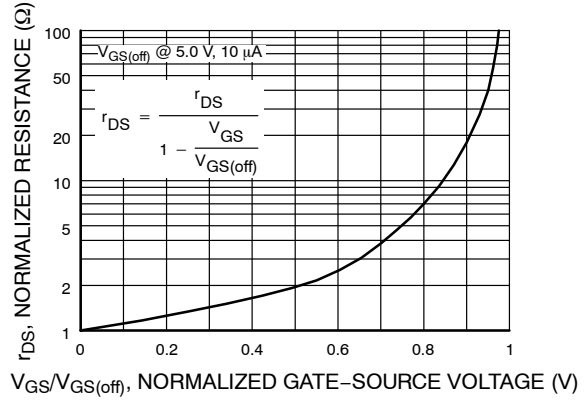


Figure 8. Normalized Drain Resistance vs. Bias Voltage

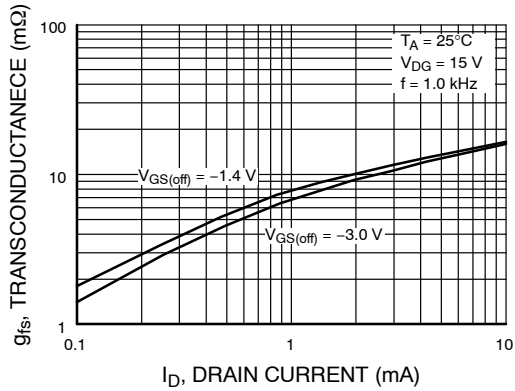


Figure 9. Transconductance vs. Drain Current

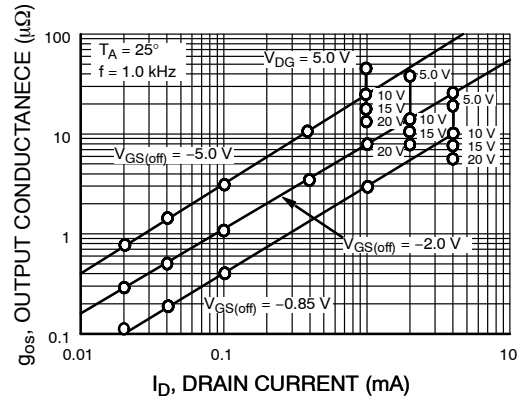


Figure 10. Output Conductance vs. Drain Current



Figure 11. Capacitance vs. Voltage



Figure 12. Noise Voltage vs. Frequency

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

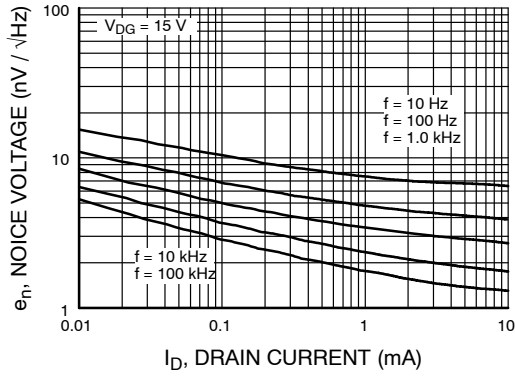


Figure 13. Noise Voltage vs. Current

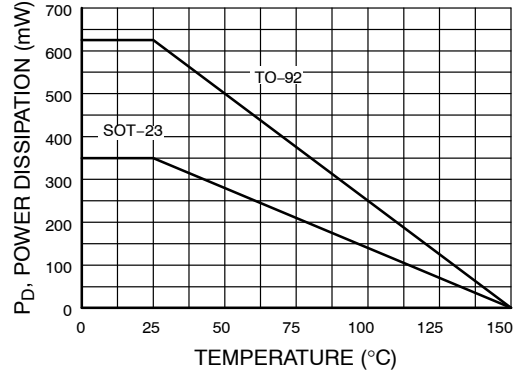


Figure 14. Power Dissipation vs. Ambient Temperature

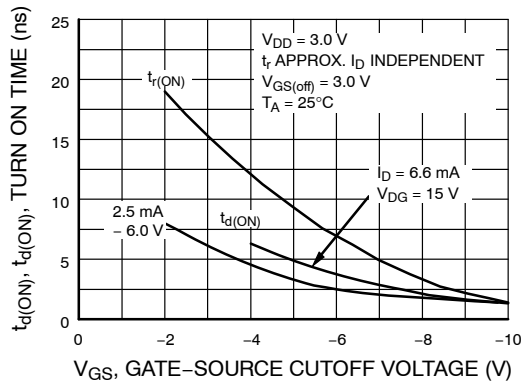


Figure 15. Switching Turn-On Time vs. Gate-Source Voltage

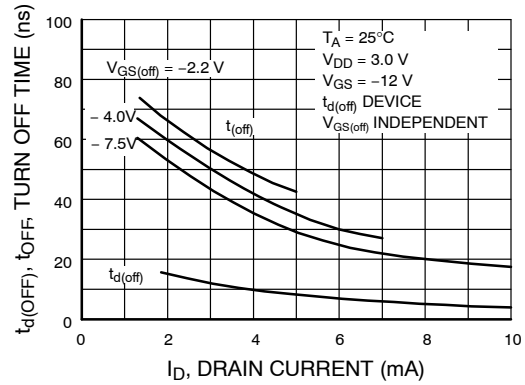


Figure 16. Switching Turn-Off Time vs. Drain Current

## J111, J112, J113, MMBFJ111, MMBFJ112, MMBFJ113

### ORDERING INFORMATION

Part Number	Top Mark	Package	Shipping <sup>†</sup>
J111	AJ 111 YWW	TO-92 3L (Pb-Free)	10000 Units / Bulk
J111-D26Z	AJ 111 YWW	TO-92 3L (Pb-Free)	2000 / Tape & Reel
J111-D74Z	AJ 111 YWW	TO-92 3L (Pb-Free)	2000 / Ammo
J112	AJ 112 YWW	TO-92 3L (Pb-Free)	10000 Units / Bulk
J112-D26Z	AJ 112 YWW	TO-92 3L (Pb-Free)	2000 / Tape & Reel
J112-D27Z	AJ 112 YWW	TO-92 3L (Pb-Free)	2000 / Tape & Reel
J112-D74Z	AJ 112 YWW	TO-92 3L (Pb-Free)	2000 / Ammo
J113	AJ 113 YWW	TO-92 3L (Pb-Free)	10000 Units / Bulk
J113-D74Z	AJ 113 YWW	TO-92 3L (Pb-Free)	2000 / Ammo
MMBFJ111	6P	SOT-23 3L (Pb-Free)	3000 / Tape & Reel
MMBFJ112	6R	SOT-23 3L (Pb-Free)	3000 / Tape & Reel
MMBFJ113	6S	SOT-23 3L (Pb-Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

**MECHANICAL CASE OUTLINE**  
**PACKAGE DIMENSIONS**

TO-92 3 4.825x4.76  
CASE 135AN  
ISSUE O

DATE 31 JUL 2016



NOTES: UNLESS OTHERWISE SPECIFIED

- A) DRAWING WITH REFERENCE TO JEDEC TO-92 RECOMMENDATIONS.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DRAWING CONFORMS TO ASME Y14.5M-2009.

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**TO-92 3 4.83x4.76 LEADFORMED**  
**CASE 135AR**  
**ISSUE O**


DATE 30 SEP 2016



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- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DRAWING CONFORMS TO ASME Y14.5M-1994

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# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



**SOT-23 (TO-236)**  
CASE 318-08  
ISSUE AS

DATE 30 JAN 2018

SCALE 4:1



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
HE	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

**RECOMMENDED SOLDERING FOOTPRINT**



**GENERIC MARKING DIAGRAM\***



XXX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

STYLE 1 THRU 5:  
CANCELLED

STYLE 6:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

STYLE 7:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR

STYLE 8:  
PIN 1. ANODE  
2. NO CONNECTION  
3. CATHODE

STYLE 9:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 10:  
PIN 1. DRAIN  
2. SOURCE  
3. GATE

STYLE 11:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE-ANODE

STYLE 12:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

STYLE 13:  
PIN 1. SOURCE  
2. DRAIN  
3. GATE

STYLE 14:  
PIN 1. CATHODE  
2. GATE  
3. ANODE

STYLE 15:  
PIN 1. GATE  
2. CATHODE  
3. ANODE

STYLE 16:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE

STYLE 17:  
PIN 1. NO CONNECTION  
2. ANODE  
3. CATHODE

STYLE 18:  
PIN 1. NO CONNECTION  
2. CATHODE  
3. ANODE

STYLE 19:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE-ANODE

STYLE 20:  
PIN 1. CATHODE  
2. ANODE  
3. GATE

STYLE 21:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN

STYLE 22:  
PIN 1. RETURN  
2. OUTPUT  
3. INPUT

STYLE 23:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 24:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE

STYLE 25:  
PIN 1. ANODE  
2. CATHODE  
3. GATE

STYLE 26:  
PIN 1. CATHODE  
2. ANODE  
3. NO CONNECTION

STYLE 27:  
PIN 1. CATHODE  
2. CATHODE  
3. CATHODE

STYLE 28:  
PIN 1. ANODE  
2. ANODE  
3. ANODE

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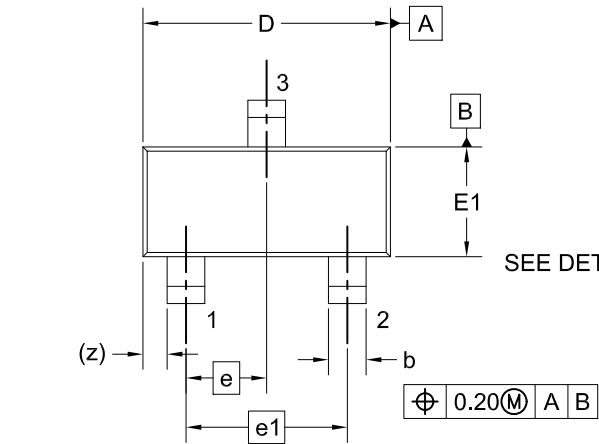


**SOT-23**  
**CASE 318BM**  
**ISSUE A**

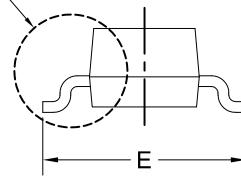
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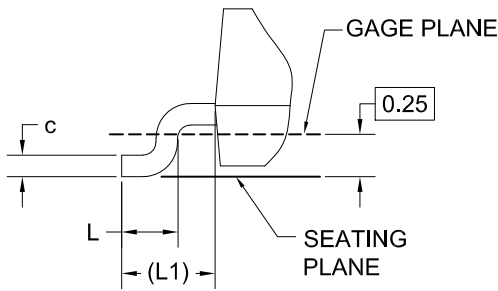
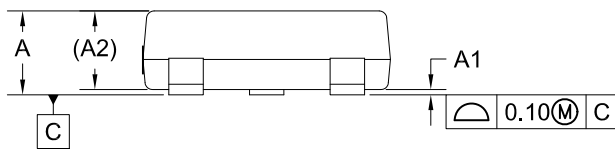
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- D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M - 2009.



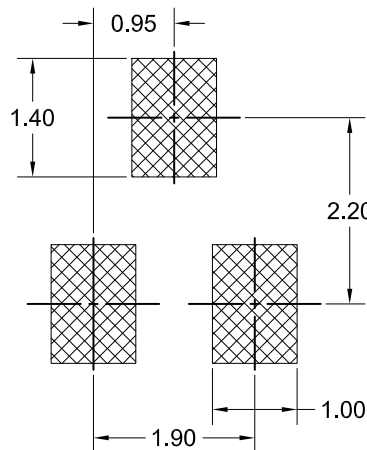
SEE DETAIL A



DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	---	---	1.20
A1	0.00	0.05	0.10
A2	0.93 REF		
b	0.37	0.44	0.60
c	0.08	0.15	0.23
D	2.72	2.92	3.12
E	2.10	2.40	2.70
E1	1.15	1.30	1.50
e	0.95 BSC		
e1	1.90 BSC		
L	0.20	---	---
L1	0.55 REF		
z	0.29 REF		

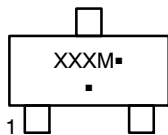


**DETAIL A**  
SCALE: 2X



**LAND PATTERN  
RECOMMENDATION**

### GENERIC MARKING DIAGRAM\*



- XXX = Specific Device Code
- M = Date Code
- = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

\*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

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Phone: 011 421 33 790 2910

**Europe, Middle East and Africa Technical Support:**

Phone: 00421 33 790 2910

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[CPH5905H-TL-E](#) [2SK2394-7-TB-E](#) [NSVJ2394SA3T1G](#) [2N3819](#) [PN4393](#) [2N4393](#) [U311](#) [2N5397](#) [2SK208-GR\(TE85L,F\)](#) [J176\\_D74Z](#)  
[IFN5566](#) [2N2609](#) [2N3823](#) [2N3970](#) [2N3971](#) [2N3972](#) [2N4091](#) [2N4092](#) [2N4093](#) [2N4118](#) [2N4118A](#) [2N4220](#) [2N4221](#) [2N4221A](#) [2N4338](#)  
[2N4339](#) [2N4341](#) [2N4416](#) [2N4416A](#) [2N4856](#) [2N4858](#) [2N4861](#) [2N4861A](#) [2N5020](#) [2N5115](#) [2N6550](#) [IF1331](#) [IF140](#) [IFN146](#) [IFN401](#)  
[IFN411](#) [IFN5434](#)